

(12) **United States Patent**
Muffie

(10) **Patent No.:** **US 9,474,210 B2**
(45) **Date of Patent:** **Oct. 25, 2016**

(54) **BEE DISPLACEMENT APPARATUS**

(56) **References Cited**

(71) Applicant: **Kevin Michael Muffie**, Saltsburg, PA
(US)

U.S. PATENT DOCUMENTS

(72) Inventor: **Kevin Michael Muffie**, Saltsburg, PA
(US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 54 days.

3,430,421 A * 3/1969 Matthews A01D 34/02
56/1
3,968,938 A * 7/1976 Ruhl E01H 1/0836
15/330
4,541,230 A * 9/1985 Huerter A01D 42/02
56/193
4,945,604 A * 8/1990 Miner A47L 5/14
15/344
5,272,858 A * 12/1993 Bonis A01D 51/00
15/340.2
5,435,118 A * 7/1995 Coble A01D 34/005
56/13.4
5,778,646 A * 7/1998 Pfisterer A01G 1/125
15/340.4
5,848,521 A * 12/1998 Kobayashi A01G 1/125
15/340.4

(21) Appl. No.: **14/504,745**

(22) Filed: **Oct. 2, 2014**

(65) **Prior Publication Data**

US 2015/0096277 A1 Apr. 9, 2015

(Continued)

Related U.S. Application Data

(60) Provisional application No. 61/886,860, filed on Oct. 4, 2013.

OTHER PUBLICATIONS

Millman, Joel. "A Scientist Teaches Drones and Queens the Birds and Bees," The Wall Street Journal, Oct. 2, 2013, US, entire article.

(Continued)

(51) **Int. Cl.**

A47L 5/00 (2006.01)
A01D 43/00 (2006.01)
A01K 29/00 (2006.01)
A01D 43/02 (2006.01)
A01K 15/00 (2006.01)
A01K 55/00 (2006.01)

Primary Examiner — Árpád Fábíán-Kovács

(74) Attorney, Agent, or Firm — Karen Tang-Wai Sutton

(57) **ABSTRACT**

A bee displacement apparatus is provided as a motorized mowing machine having a motorized blower of less than 1000 CFM with a funnel attachment having a neck and a mouth at opposed ends, the funnel attachment tapering both horizontally and vertically from the neck to the mouth such that a horizontal measurement of the mouth is larger than a horizontal measurement of the neck, and a vertical measurement of the mouth is smaller than a vertical measurement of the neck so that the mouth approximates a narrow, widened slot. In use, the bee displacement apparatus, the mouth is positioned in front of a cutting deck of the motorized mowing machine such that when the motorized blower is operated, a concentrated air stream is forced out of the mouth at an area of vegetation directly in front of the cutting deck.

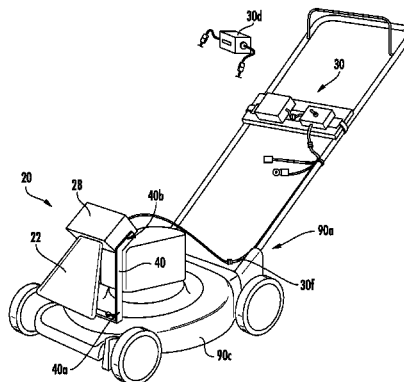
(52) **U.S. Cl.**

CPC **A01D 43/00** (2013.01); **A01D 43/02** (2013.01); **A01K 15/00** (2013.01); **A01K 29/00** (2013.01); **A01K 55/00** (2013.01)

(58) **Field of Classification Search**

CPC A01G 1/125; A01D 2101/00; A01D 34/001; A01D 34/82; A01D 42/02; A01D 43/00; A47L 5/14; A47L 9/08; A47L 9/06; E01H 1/0809; E01H 1/0872
USPC 15/405, 246; 56/16.9, DIG. 8, 12.8
See application file for complete search history.

6 Claims, 11 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

6,185,917 B1 * 2/2001 Goudes B62B 3/02
56/12.8
6,353,960 B1 * 3/2002 Jannicelli, Jr. A46B 17/02
15/106
6,658,833 B2 * 12/2003 Dunning A01G 1/125
56/16.6
7,603,738 B1 * 10/2009 Woodcock A01G 1/125
15/340.1
7,814,615 B1 * 10/2010 Ries A01D 7/10
15/327.5
8,056,177 B2 * 11/2011 Hammad A01G 1/125
15/349

8,225,450 B2 * 7/2012 Petersen A47L 9/06
15/106
2015/0296718 A1 * 10/2015 Houseman A01G 1/125
56/17.5

OTHER PUBLICATIONS

Wills, Rick. "Global Warming Skeptic Wary of Worries about Bee Colony Collapse Disorder," TribLive online news Sep. 22, 2013, Pittsburgh Tribune Review, US, entire article.
Walsh, Bryan. "The Plight of the Honeybee," Time Magazine, Aug. 19, 2013, US, entire article.

* cited by examiner

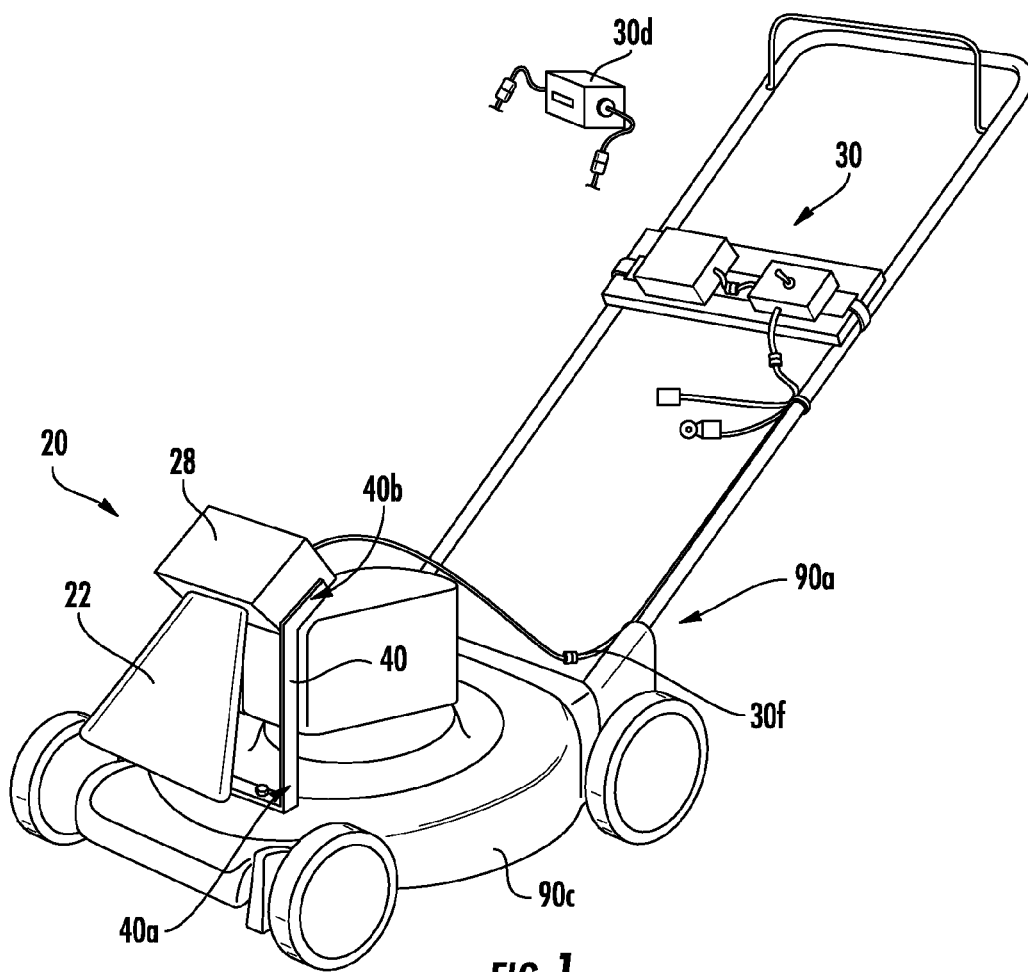


FIG. 1

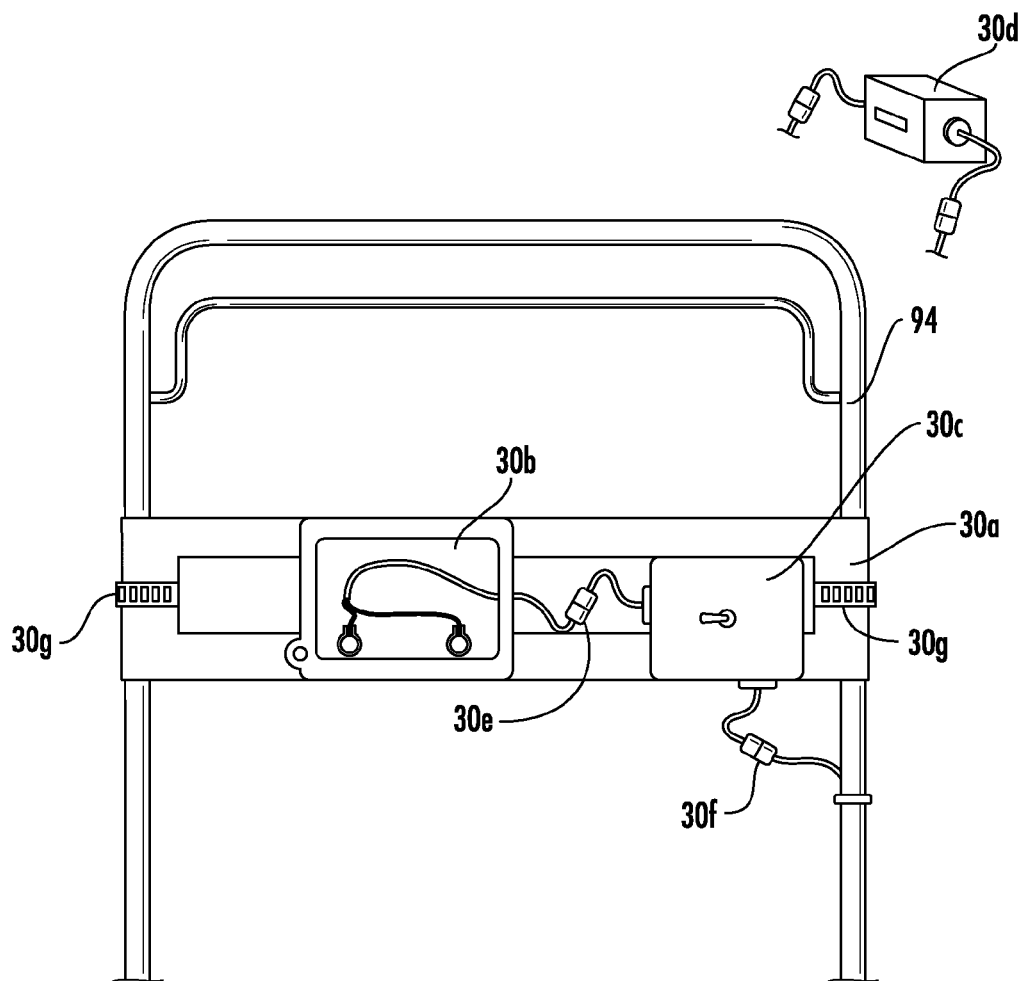


FIG. 2

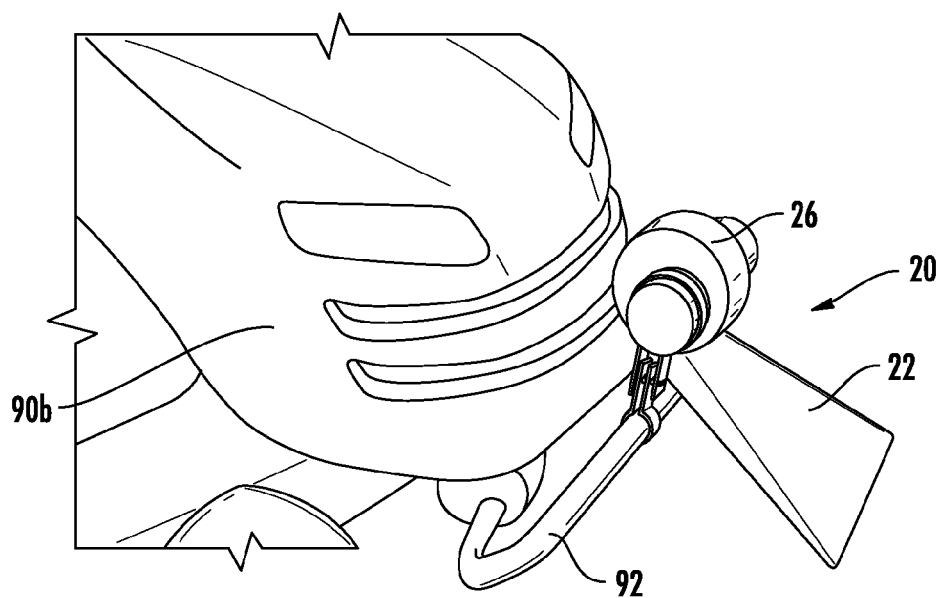


FIG. 3

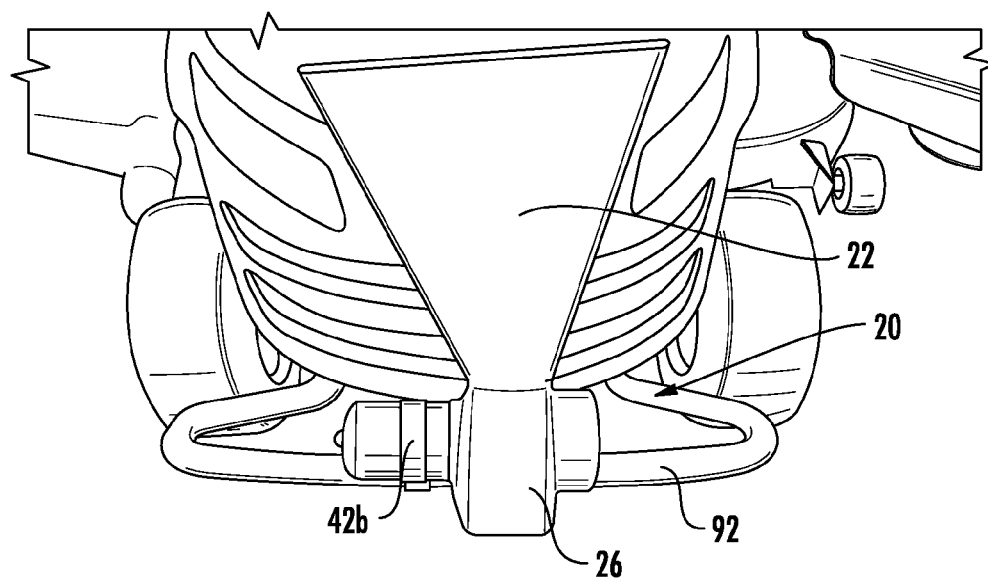


FIG. 4

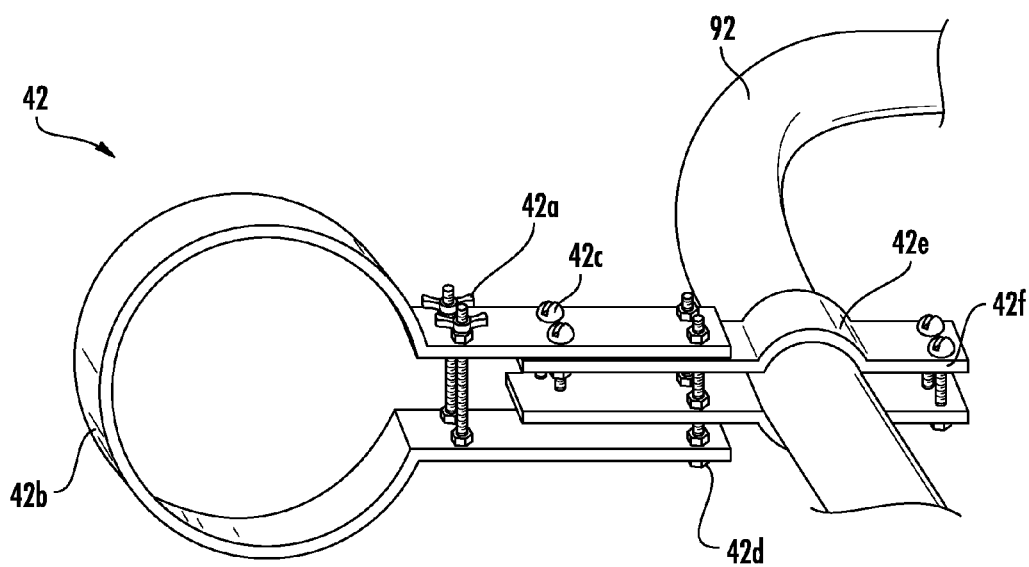
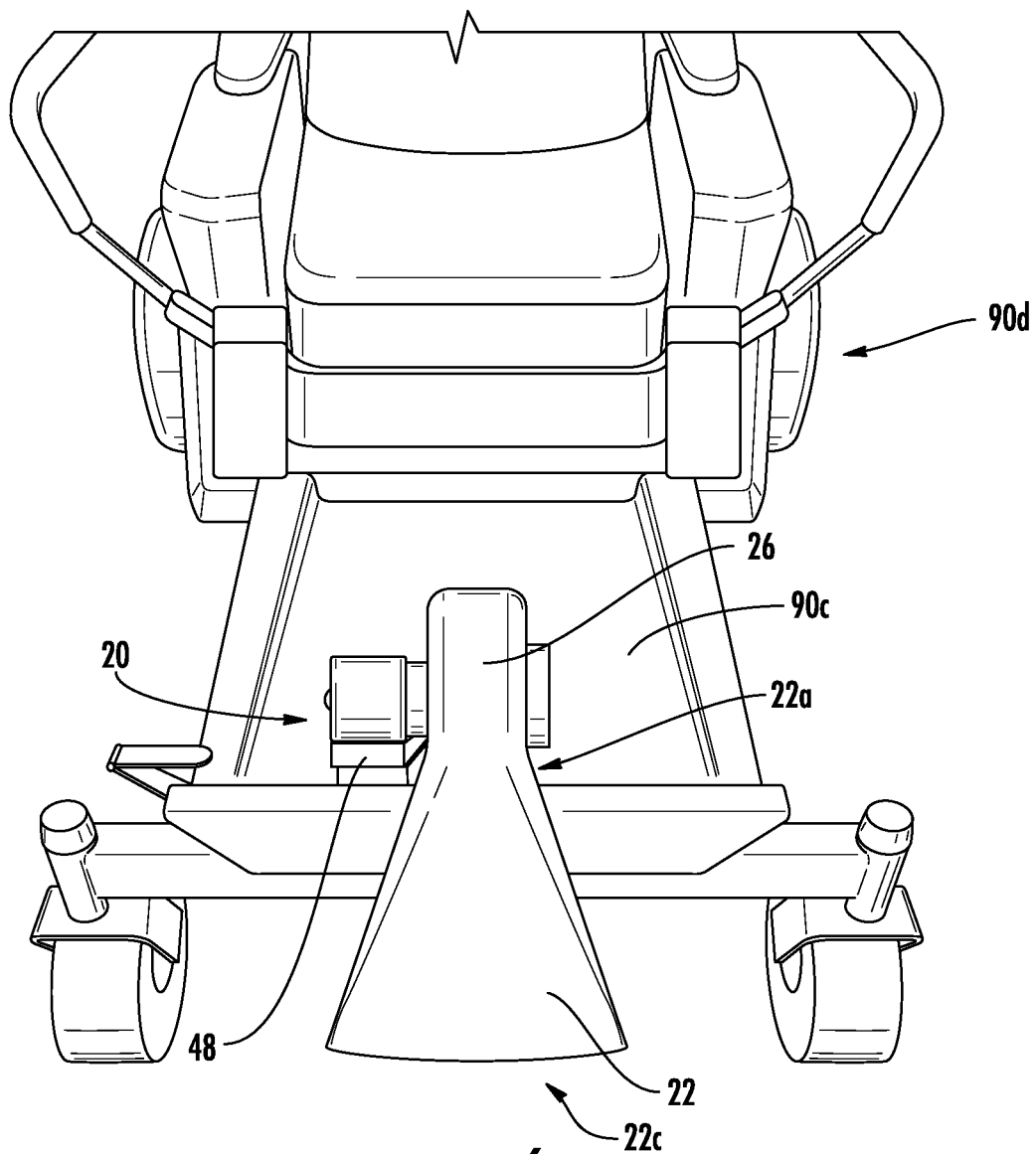
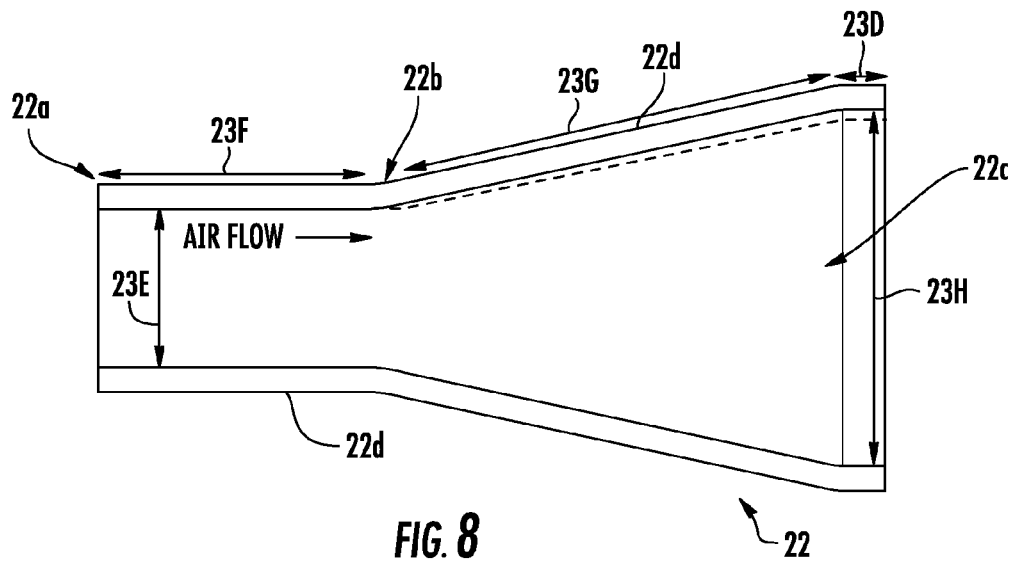
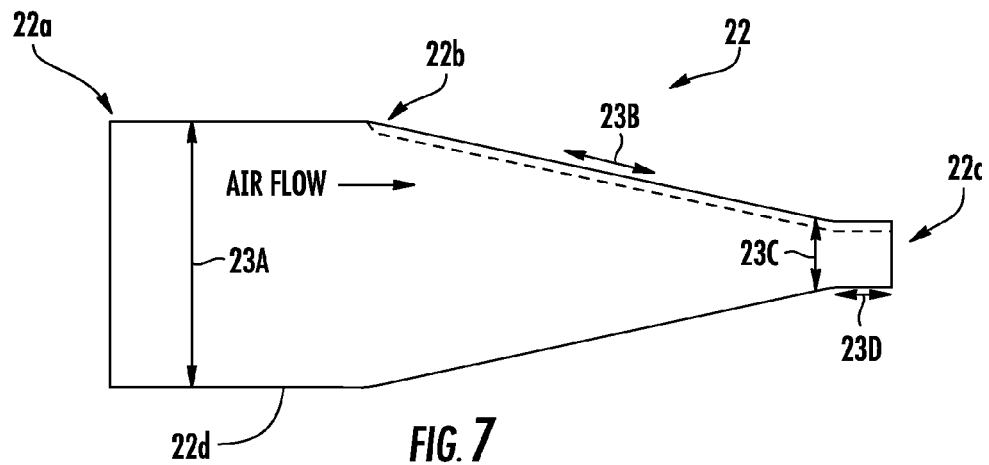


FIG. 5





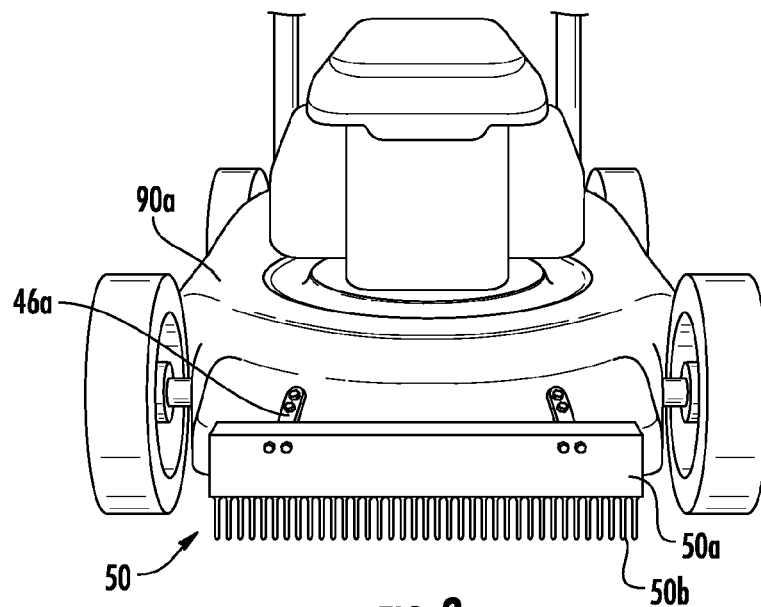


FIG. 9

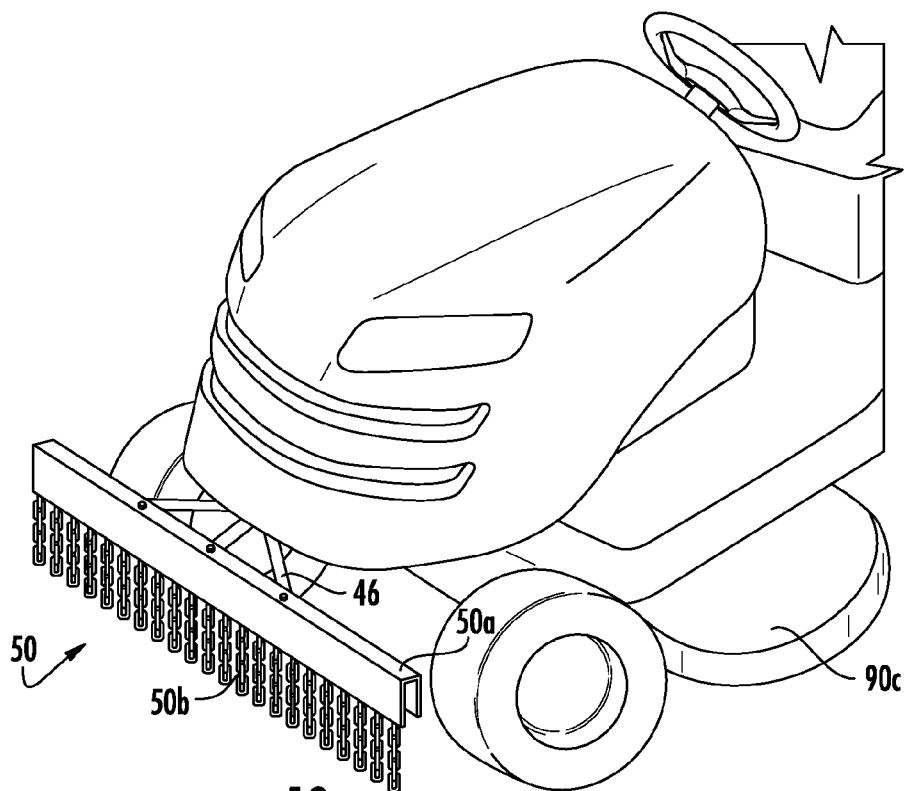


FIG. 10

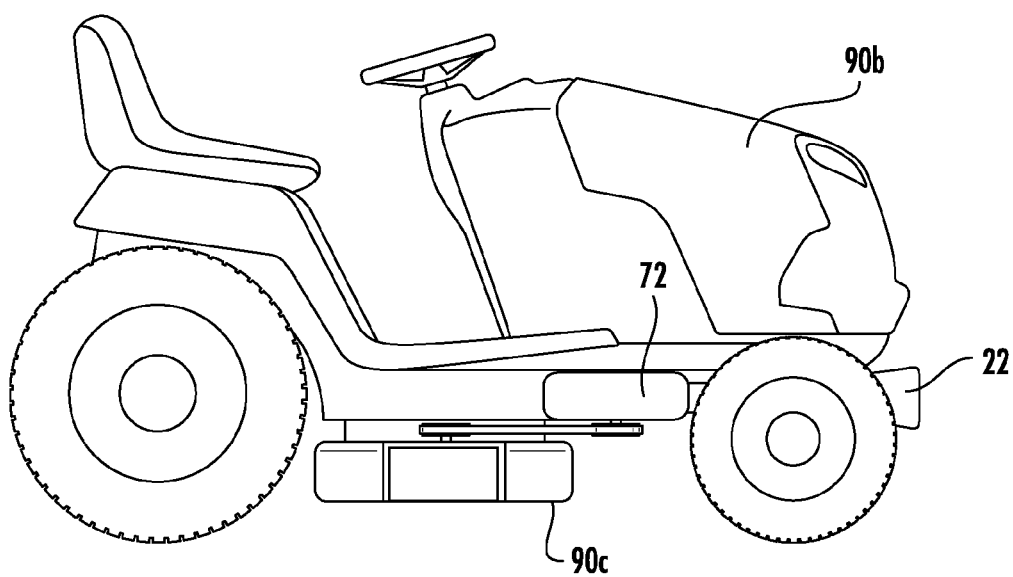


FIG. 11

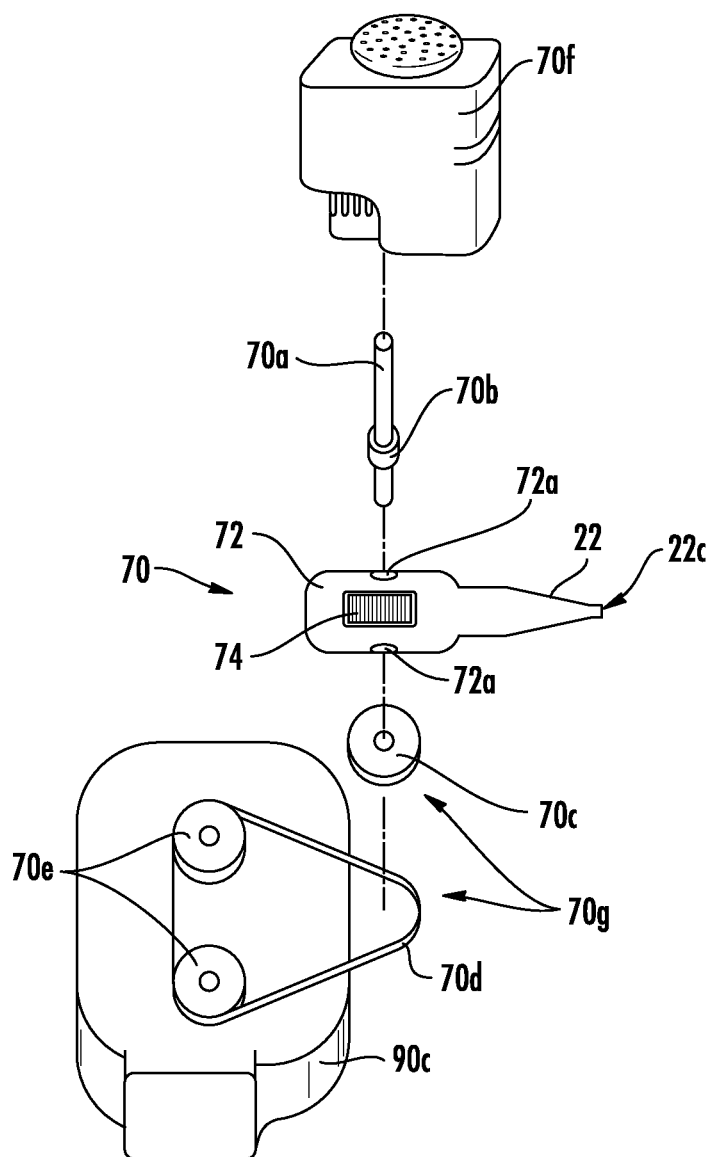


FIG. 12

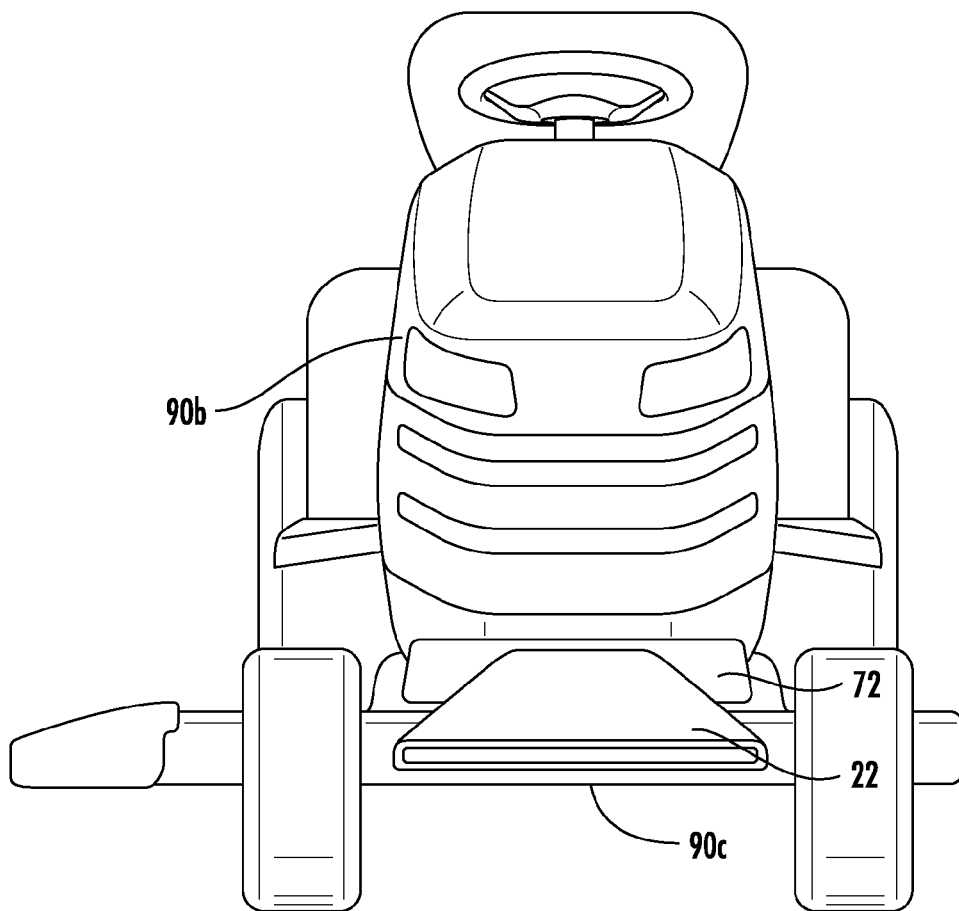


FIG. 13

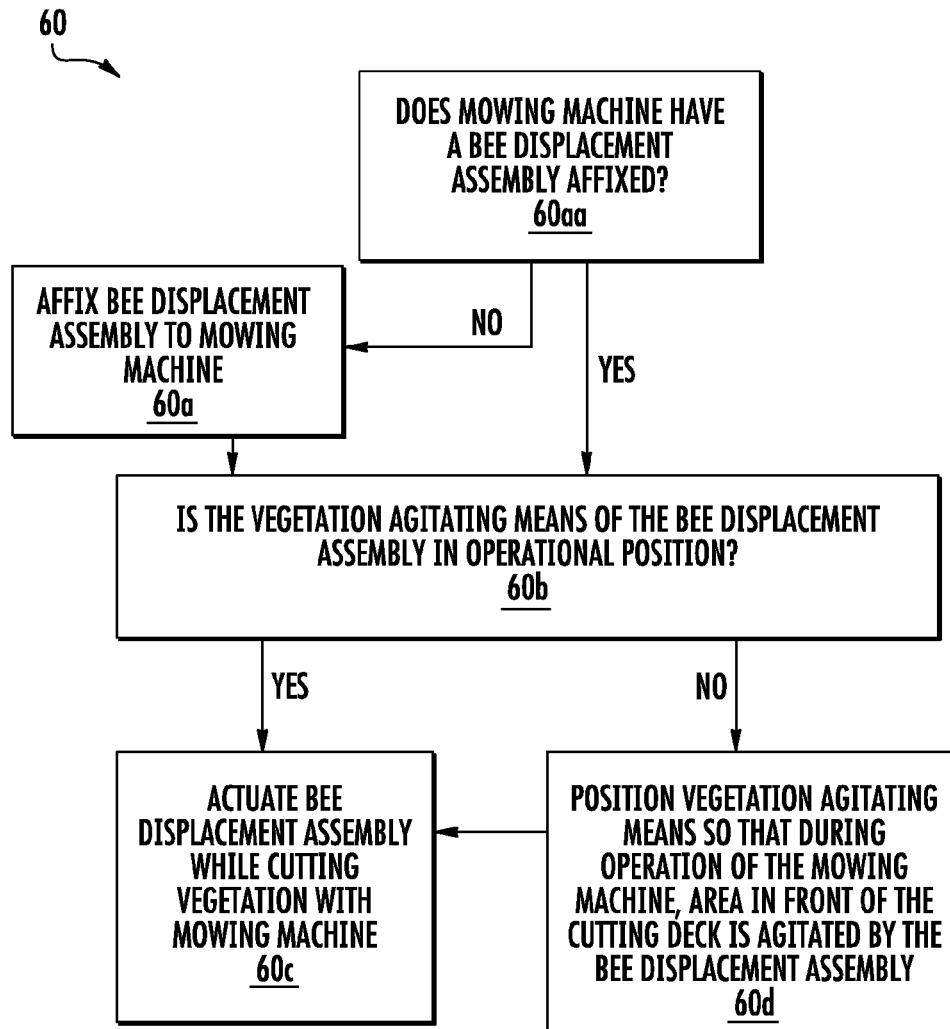


FIG. 14

1

BEE DISPLACEMENT APPARATUS**CROSS REFERENCE To RELATED APPLICATION**

Reference is made to and priority claimed from U.S. provisional application Ser. No. 61/886,860 filed Oct. 4, 2013.

TECHNICAL FIELD

The present invention pertains to the field of gardening implements. More particularly, the present invention pertains to a detachable or an integrated blowing assembly and other mechanical means for use with motorized mowing machines, for displacing honeybees and other animals from vegetation immediately prior to mowing, so as to save the animals from being killed by the mowing machine.

BACKGROUND OF THE INVENTION

Honeybees worldwide are threatened by a mysterious problem known as Colony Collapse Disorder, or CCD, where the colony loses significant numbers of adult bees and thus cannot sustain itself. This disorder affects the European Honeybee, a valuable pollinator and honey producer here in the US and in Europe. The cause of CCD is unknown at this time, and beekeepers, scientists, and citizens alike are interested in saving as many bees as possible. For instance, the Aug. 19, 2013 issue of Time Magazine features a front page story on the plight of the honeybee, the Sep. 23, 2013 issue of the Pittsburgh Tribune Review featured a story on the European response to CCD, and the Oct. 2, 2013 issue of the Wall Street Journal features a front page article by Joel Millman entitled "A Scientist Teaches Drones and Queens the Birds and Bees" discussing ways in which scientists are trying to reinvigorate honeybee populations by crossbreeding and introducing more diverse genetic material into native honeybee populations. These articles, and many more, discuss an "all the above" approach to the problem of CCD and saving as many bees as possible.

Honeybees love clover, a common plant found in fields and lawns. The bees are so determined to collect pollen from clover and other flowers ordinarily found in lawns and fields that they will not move out of the way, even with the maw of a noisy lawn mower bearing down on them. In some cases, the lawn mower operator can shoo the bee away from the front of the mower, but in many cases, the bee will tenaciously grasp the flower to avoid being dislodged by even moderately strong winds or agitation by sticks, and worse, the operator often cannot even see the bee, who might be on the underside of the flower or otherwise hidden. Hundreds of bees are killed during a single mowing of a typical American lawn, and about 75% of the bees killed by mowing are the ones busy pollinating flowers in the mowed vegetation. Furthermore, placing anything in front of an operational lawn mower creates a danger to the operator, as any attachment to the front of the lawn mowing machine may inhibit the operation of the mower itself and distractions in general are dangerous.

What is needed is a method and assembly to displace bees from fields and lawns that does not harm the bees, is easy to use, and can be safely retrofitted to a number of different lawn mowing machine styles.

DISCLOSURE OF THE INVENTION

Accordingly, a first aspect of the invention provides an improved funnel attachment for a bee displacement assem-

2

bly, the funnel attachment having walls defining a passageway with a neck opening and opposed mouth opening, and a midpoint positioned between the neck and the mouth, wherein the passageway is further defined by a pair of opposed sidewalls, a ceiling and a floor; the ceiling and the floor arranged in a spaced apart relationship defining a first diameter, wherein at the midpoint, the first diameter tapers to the mouth such that the first diameter at the neck is greater than the first diameter at the mouth.

Also, in accord with the first aspect of the invention, the funnel attachment is further provided with the sidewalls arranged in a spaced apart relationship defining a second diameter, wherein at the midpoint, the sidewalls flare away from each other and terminate at the mouth, such that the second diameter at the mouth is greater than the second diameter at the neck.

A second aspect of the invention provides for a displacement assembly used with a motorized mowing machine, the displacement assembly including a blower assembly having a blower and having the funnel attachment affixed to the blower assembly. The blower assembly is positioned on the front of the motorized mowing machine.

Also, in accord with the second aspect of the invention, the blower is powered by its own motor or by a pulley-belt system coupled to a fan and to a motor of the motorized mowing machine.

Also, in accord with the second aspect of the invention, the displacement assembly is selectively operated by power means and a control assembly.

A third aspect of the invention provides for a displacement assembly kit comprising the blower, the funnel attachment, power means, and adaptors allowing the displacement assembly to be affixed to the motorized mowing machine.

Still in accord with the third aspect of the invention, wire harnesses are provided to couple the power means to the blower for simple installation.

A fourth aspect of the invention provides for a rake having a plurality of tines, the rake positioned on the mowing machine so as to agitate vegetation directly in front of a cutting deck of the mowing machine.

A fifth aspect of the invention provides for a method of displacing animals while mowing vegetation, according to the steps of positioning the displacement assembly so that the vegetation agitation portion of the displacement assembly disturbs an area of vegetation directly in front of the mowing machine cutting deck during operation of the mowing machine. The method provides for use of the rake apparatus as well as the blower assembly, used either separately or together, to agitate vegetation.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the invention will become apparent from a consideration of the subsequent detailed description presented in connection with accompanying drawings, in which:

FIG. 1 is a perspective view of the bee displacement assembly according to the invention adapted for use with a typical so-called push mowing machine, the bee displacement assembly oriented in an operational position.

FIG. 2 is a detailed front elevational view of a power assembly of the bee displacement assembly of FIG. 1.

FIG. 3 is a perspective view of the bee displacement assembly adapted for use with a typical so-called residential-style riding mowing machine, with the invention oriented in the operational position.

FIG. 4 is a front elevational view of the bee displacement assembly shown in FIG. 3, where the displacement assembly is oriented in a non-operation position.

FIG. 5 is a perspective view of a clamp used to affix the bee displacement assembly according to the invention to the riding mowing machine shown in FIGS. 3 and 4.

FIG. 6 is a front elevational view the bee displacement assembly according to the invention, as shown in the operational position on a so-called professional-style riding mowing machine.

FIG. 7 is a side elevational, cross sectional view of a funnel attachment portion of the invention.

FIG. 8 is a top, cross sectional view of the funnel attachment in FIG. 7.

FIG. 9 is a front elevational view of a first embodiment of a bee displacement rake assembly according to the invention, as it would appear affixed to the riding mowing machine.

FIG. 10 is a perspective view of a second embodiment of the bee displacement rake assembly, as it would appear affixed to the riding mowing machine.

FIG. 11 is a side elevational view of a second embodiment of the bee displacement assembly according to the invention, in which a motor of the mowing machine turns a fan housed within a secondary deck structure.

FIG. 12 is a cross sectional, side elevational view of the second embodiment of the bee displacement assembly from FIG. 11, showing how the second embodiment is installed in the mowing machine via an exploded view of the mowing machine's motor, pulley system and cutting deck.

FIG. 13 is a front elevational view of the second embodiment of the bee displacement assembly in FIG. 11.

FIG. 14 is a diagrammatic representation of a method of using the bee displacement assembly.

DRAWINGS LIST OF REFERENCE NUMERALS

The following is a list of reference labels used in the drawings to label components of different embodiments of the invention, and the names of the indicated components.

20 blower assembly
 22 funnel attachment
 22a neck of funnel
 22b midpoint
 22c mouth of funnel
 22d wall
 23A first diameter (height) measured at neck
 23C first diameter (height) measured at mouth
 23B length of wall
 23E second diameter (width) measured at neck
 23H second diameter (width) measured at mouth
 23G length of wall
 23D mouth extension
 28 blower box
 26 blower
 30 power assembly
 30a power bracket
 30b battery or power supply
 30c power supply on/off controls
 30d battery charger
 30e first wire harness
 30f second wire harness
 30g fastener
 40 angled bracket
 40a lower position of angled bracket
 40b upper position of angled bracket
 42 bumper bracket

42a first fastener
 42b blower clamp
 42c second fastener
 42d third fastener
 42e bumper clamp
 42f fastener
 46a rake bracket for push mower
 46 rake bracket for riding mower
 48 bracket for professional mower
 50 rake assembly
 50a head
 50b tines
 60 method for displacing bees
 60aa determine if mowing machine has a bee displacement assembly already affixed
 60a affix bee assembly to mowing machine
 60b determine if bee displacement assembly is in an operational position
 60c actuate bee displacement assembly
 60d position bee displacement assembly into operational position
 70 second blower assembly
 70a shaft
 70b clutch
 70c drive pulley
 70d belt
 70e pulley
 70f motor of mowing machine
 70g pulley-belt system
 72 fan housing or secondary deck
 72a hole
 74 fan
 90a push-style mowing machine
 90b residential-style riding mowing machine
 90c deck of mowing machine
 90d professional-style riding mowing machine
 92 bumper or front bar
 94 handle portion of mowing machine

DETAILED DESCRIPTION

A bee displacement assembly according to the invention is shown in FIGS. 1-13, and a method of using the bee displacement assembly is shown in FIG. 14.

Turning now to the Figures, a first embodiment of the bee displacement assembly is provided as a blower assembly 20 coupled to a power assembly 30 adapted for use with grass, brush or other vegetation-cutting machines. For use with a push-style mowing machine 90a, the blower assembly 20 is affixed to a cutting deck 90c of the mowing machine 90a, and the power assembly 30 is affixed to a handle portion 94 of the mowing machine 90a, as shown in FIGS. 1-2. For use with a residential-style riding mowing machine 90b, the blower assembly 20 is affixed to a bumper or front bar 92, as shown in FIGS. 3-4, and for a professional or zero-turn style mowing machine 90d as shown in FIG. 6, the blower assembly 20 is typically affixed to a location on the front cutting deck 90c with a bracket 48.

It should be noted that while the Figures show specific placement of the blower assembly 20 on the various types of mowing machines, these positions are suggestive of suitable locations only and not meant to limit the location of the blower assembly to just those locations. The inventor has found that an acceptable placement location of the blower assembly 20 is one in which during actuation of the blower, a concentrated stream of air is directed at an area in front of the cutting deck 90c, the stream of air angled downwards so

5

as to sufficiently agitate the vegetation to be mowed prior to mowing by the cutting deck 90c. Hence, it is possible to orient the blower assembly so as to direct a stream of air perpendicular to the forward motion of the operational mowing machine, so long as the stream of air sufficiently agitates vegetation in the area directly in front of the cutting deck 90c.

Turning now to FIGS. 1, 3-5, and FIGS. 7-8, the blower assembly 20 is further comprised of a funnel attachment 22 coupled to a blower 26. In a typical embodiment, the funnel attachment 22 is removably coupled to the blower 26, as shown in the Figures, although in other embodiments, the funnel attachment 22 is permanently affixed to the blower 26. In the embodiment shown in FIG. 1, the blower assembly 20 is further provided with a protective box 28 housing the blower 26, the box 28 further including a filter or screen (not shown) so as to allow the free flow of air required for blower operation but which filters out particles that may otherwise clog a motor (not shown) of the blower 26. In the embodiment shown in FIGS. 3-4 for a residential-style riding mowing machine 90b, the blower 26 is shown without the blower box 28. In some embodiments, the blower 26 is further provided with a blower mouth (not shown) that couples to a neck 22a of the funnel attachment. In other embodiments, where the funnel attachment is not removable, the blower mouth is shaped and elongated so as to serve a same function as the funnel attachment 22.

FIG. 7 is a cross sectional, side elevational view and FIG. 8 is a cross sectional top elevational view of the funnel attachment 22. Turning now to FIGS. 7-8 the funnel attachment 22 is further provided with walls 22d defining a passageway separating a neck 22a and an opposed mouth 22c, with a midpoint 22b positioned between the neck 22a and the mouth 22c.

Looking at FIG. 7, the neck 22a, in a first diameter 23A, is about three inches tall, and from the midpoint tapers downwards to the mouth 22c at a first diameter 23C, so that the first diameter 23C at the mouth 22c is between half to one inch tall. Further, the mouth 22c itself extends outwards about one inch forming a mouth extension 23D, although the inventor notes that in some embodiments, the extension 23D can be eliminated, or increased over 1 inch, as desired.

Looking now at FIG. 8, in a typical embodiment, the neck 22a is approximately three inches wide in a second diameter 23E, and at the midpoint 22b, the walls 22d progressively flare out over a length of about 7 to 10 inches, terminating at a second diameter 23H at the mouth 22c. At the mouth 22c, the second diameter 23H measures between 7 to 15 inches wide. Regarding the second diameter 23H, the inventor has noted that a width of 15 inches is an approximate ideal maximum width for the mouth 22c. In FIGS. 7 and 8, the wall length 23B 23G is about 7 inches, although could be effectively shortened or lengthened as desired and not decrease functionality of the funnel attachment. The vertical height tapering shape coupled with the horizontal width flaring shape of the funnel attachment is critical to proper operation of the invention.

The inventor has found that this particular embodiment shown in the Figures, used with a 240 CFM blower, results in a concentrated air stream able to effectively disperse bees in an area measuring about 38 to 48 inches wide located directly in front of the mouth 22c, the range of widths listed being approximately the cutting widths of the mowing machine cutting decks 90c. For the push-style mowing machine, the funnel attachment width at the mouth is about 9-10 inches for a 42 inch cut or wider. On a residential-style riding mowing machine, the funnel attachment mouth width

6

is typically 14 inches, and up to 20 inches or more in width for a 45 inch cutting width. The inventor has tested many widths for the second diameter 23H, and notes that it typically better to use 2 blower assemblies on the mowing machine than attempt to make the funnel mouth second diameter 23H wide enough to adequately cover a mowing machine with a cutting width wider than 45 inches, since the wider and larger the mouth, the decrease in air pressure for the concentrated stream of air emitted from the mouth.

The funnel attachment 22 can accommodate larger mowing machines as well by simply by altering the length 23G 23B of the walls 22d, or by using multiple blower assemblies 20, or various combinations of multiple blower assemblies and/or larger funnel attachments 22. While the inventor has given some specific dimensions related to the funnel attachment 22, the inventor notes that a tapering height from neck to mouth (the first diameter) coupled with a flaring width shape (the second diameter) for the funnel attachment 22, where the relatively larger neck height dimension tapers down to a flattened mouth while the smaller initial neck width flares out into a wider mouth, are a critical feature of the invention, and the actual dimensions suggested are suggested guidelines only. It is the unique tapering-flaring shape of the funnel attachment which concentrates moving air generated by the blower or blower means 70 that is forced through the funnel attachment mouth 22c and emitted as the concentrated stream of air that is strong enough to effectively disperse bees and other animals along the front width of the mowing machine's cutting deck 90c. The dimensions given are thus an example of one embodiment of the funnel attachment 22, and are not meant to limit the funnel attachment 22 to these dimensions.

So long as the tapering-flaring shape of the funnel attachment 22 is maintained, a variety of dimensions for the funnel attachment are possible, however, the inventor has found that the given dimensions provide the most effective bee dispersion. In yet other embodiments (not shown), multiple inventions may be used simultaneously, so as to cover an entire width of the cutting bed 90c, without loss of air pressure due to an overly wide funnel attachment mouth.

The blower assembly 20 in a typical embodiment is removably affixed to the mowing machine 90a 90b 90d with a plurality of attachment means, such as an angled bracket 40 as shown in FIG. 1 for the push-style mowing machine 90a, a clamp 42 (FIG. 5) for attaching the blower assembly 20 to the bumper bar 92 of the residential-style riding mowing machine (FIGS. 3-4), and the simple bracket 48 on the professional-style riding mowing machine 90d (FIG. 6). The attachment means shown in the Figures are representative of some suitable methods of attaching the bee displacement assembly to the mowing machines 90a 90b 90d however the inventor has noted and tested many other styles of brackets, clamps, and other attachments means that are suitable for use with the bee displacement assembly, and the Figures are illustrative of just a few possible ways of affixing the bee displacement assembly to the various lawn mowing machines.

In FIG. 1, the angled bracket 40 is affixed to both the blower box 28 and the mowing machine 90. The angled bracket 40 is generally L-shaped, and adapted to receive the blower box (housing the blower) and funnel attachment 22 so that the blower assembly 20 can be placed at a lower position 40a or a higher position 40b on the angled bracket 40 as desired. The inventor has found that the best operational angle of the funnel attachment ideally emits a stream of concentrated air generally horizontally across the vegetation in front of the cutting deck, rather than forcing the air

downwards on the vegetation, since sometimes air that is angled downwards knocks the bees deeper into the vegetation (where they end up getting run over by the mower and killed) but a more horizontal air stream tends to displace the bees so that they fly away from danger.

For the residential-style riding mowing machine **90b** shown in FIGS. 3-4, and in more detail in FIG. 5, the clamp **42** is comprised of a blower clamp **42b** affixed to a bumper clamp **42e** by way of adjustable fasteners **42a 42c 42d**, the bumper clamp **42e** removably affixed to the bumper **92** of the mowing machine **90b** by fasteners **42f**. The adjustable fasteners **42a 42c 42d** allow the blower assembly **20** to be pivotably affixed to the clamp **42**, so that the angle at which the stream of air is emitted through the mouth **22c** may be adjusted, as necessary, shown in FIGS. 3-4. When not in use, the blower assembly **20** can be adjusted upwards, as shown in FIG. 4, or simply left in operational position, as shown in FIG. 3, as desired.

The blower **26** is typically a motorized blower powered by a power assembly **30** (see FIG. 2), by way of a wire harness **32b** coupling the blower **26** to an on/off switch assembly **30c**, and by a second wire harness **32a** coupling the on/off switch assembly **30c** to a battery **30b**. The on/off switch assembly **30c** is further provided with a fuse (not shown) housed inside an electrical box. The battery **30b** is provided as a 12 volt battery weighing approximately four pounds, and capable of providing about an hour's worth of blower operation. The wire harnesses **32a 32b** are provided so as to facilitate easy connection and disconnection of the power assembly **30**. The inclusion of the battery allows manufacturers of push-style mowing machines to incorporate an electric start for the mowing machine. In other embodiments (not shown), lights may be included in the power assembly **30** that are powered by the battery **30b**. The power assembly **30** is affixed to the push-style lawn mowing machine **90a** by way of a power bracket **30a** removably affixing the power assembly **30** to a handle portion **94** of the push-style mowing machine **90a**.

In yet another embodiment, the bee displacement assembly is provided as a kit comprising the blower assembly **22**, a power assembly **30**, and an optional battery charger **30d**, along with a suitable bracket or other attachment means, so as to allow retrofitting existing push-style mowing machines **90a**. For retrofitting existing riding mowing machines **90b 90d**, the kit includes the blower assembly **22**, the appropriate attachment means, and the on/off power assembly **30c** and appropriate wire harnesses **30d 30f** so as to allow the blower assembly to be coupled to the mowing machine's existing power supply to power and permit the use of the external on/off control **30c**. The funnel attachment **22** may also be sold without the blower **26** in a variety of dimensions.

Suitable blowers used by the inventor includes the Dayton® series blowers, and the Jabsco Blower, Flex Mount, 250 CFM, 12 VDC sold by W. W. Grainger Inc., of Lake Forest, Ill. 60045-5201, for a blower that is 7×7×7 inches, fitting an enclosure box measuring about 8×8×8 inches. Other blowers in the range of 240 to 250 CFM are suitable for use with the invention. For hook up to the mowing machine's internal battery, or powering the blower using a separate battery, an off the shelf blower and mowing machine can be used, retrofitted with the funnel attachment **22** and affixed to the mowing machine using the appropriate blower **26** or blower assembly **20**, as needed, and also with the appropriate power assembly **30**, depending on the style of mowing machine.

In yet another embodiment, shown in FIGS. 11-13, a second blower assembly **70** is shown coupled to existing

apparatuses of the mowing machine **90b**. The second blower assembly **70** is comprised of a fan **74** enclosed in an interior space of a secondary deck or fan housing **72**, the housing **72** having a pair of opposed through-bores **72a** sized and shaped to receive a drive shaft **70a** and a clutch **70b** of the mowing machine **90b**. The fan housing is further configured with an opening adapted to receive the funnel attachment **22**, or in some embodiments, as shown in FIG. 12, the funnel attachment **22** and fan housing **72** are formed as a single housing preserving the unique tapering-flaring shape of the funnel attachment **22**.

Turning now to FIG. 12, the blower assembly **70** is coupled to an engine or motor **70f** as well as to a pulley system **70g** of the mowing machine **90b** via the drive shaft-clutch system. The pulley system **70g** is typically installed on the cutting deck **90c** of the mowing machine, and the drive pulley **70c** and a set of other pulley wheels **70e** linked together by a drive belt **70d** are turned by the motor **70f** turning the drive shaft-clutch system. The pulley system is responsible for powering a plurality of cutting blades housed under the mowing deck **90c**. In the embodiment shown in FIGS. 11-13, the fan **74** is turned directly by the motor **70f** via the drive shaft **70a**, but the inventor notes that he has tested an embodiment of the blower assembly **70** (not shown) that can be powered by a secondary pulley system, by adding a second pulley and second belt to the existing system, so that the motor turns both pulley systems, and the second system is used to turn the fan **74** and create the concentrated stream of air needed to disperse the bees.

An on/off switch (not shown) is included with the controls of the mowing machine, and in some instances, such as when an existing mowing machine is retrofitted with the bee displacement assembly, the on/off switch may be housed in a control box affixed to the outside of the mowing machine housing. The inventor has experimented with a number of different ways to selectively operate the fan **74**, such as with lever-cable-spline arrangements, although he notes that there are many ways in which selective operation of the second blower assembly **70** can be achieved. In the embodiment shown in the Figures, the bee displacement assembly is on only when the motor is running.

To use the bee displacement assembly using the second blower assembly, an operator starts the motor of the mowing machine **90b**, and turns on the bee displacement assembly. The clutch **70b** engages the drive shaft **70a** and the drive pulley **70c**. The drive pulley engages the belt **70d**, which turns the other pulleys **70e** linked by the belt **70d** to the drive pulley. The cutting blades of the mowing machine are activated, and the drive shaft turns the fan **74**, generating moving air that is then in turn channeled and emitted through the funnel attachment **22** as the concentrated stream of air. When the operator stops the motor, the bee displacement assembly is also turned off.

The bee displacement invention displaces bees by physically agitating vegetation directly in front of the cutting deck **90c**. In yet another embodiment of the bee displacement invention, shown in FIGS. 9-10, a rake attachment **50** is affixed to the mowing machine by way of a bracket **46 46a** or other attachment means, the rake having a head **50a** and attached tines **50b** projecting from the head **50a** in a downwards orientation (towards the ground). The tines **50b** are positioned so as to agitate the vegetation directly in front of the cutting deck when the mowing machine is in operation, encouraging the bees to move away from the immediate vicinity. In a first embodiment, shown in FIG. 9, the tines **50b** are arranged in a regular spaced-apart relationship, and are comprised of metal, plastic or other suitably strong,

flexible material. The inventor notes that memory metal is an ideal material for the tines, as it is durable and flexible. In a second embodiment, shown in FIG. 10, the tines **50b** are flexible, and may be comprised of small chains (as shown) that drag against the vegetation which allows for mowing over uneven surfaces as the tines self adjust to the height of the ground, preventing the tines from digging into the ground or otherwise damaging the vegetation. The rake **50** may be used alone or in conjunction with the blower assembly **22 70**. In still another embodiment, the rake **50** is adjustably affixed to the mowing machine **90a 90b 90d** so as to allow the operator to lift the rake as needed or desired independently of operation of the blower assembly and the mowing machine. In this way, the operator can decide whether to use just the blower assembly, the rake, or both together.

Looking now at FIG. 14, a method **60** of displacing bees and other animals using the bee displacement assembly, the invention, configured either with a blower assembly **20** or a second blower assembly **70** is affixed to the desired mowing machine **90a 90b 90d 60a** if the mowing machine is not already outfitted with the bee displacement assembly. Then, the operator must determine if the vegetation agitation means **20 22 50** is in an operational position **60b**. Operational position for the bee displacement assembly using the blower assembly **20 70** and funnel attachment **22** requires the funnel attachment **22** to be positioned so that the mouth **22c** is angled in front of the cutting deck **90c**. For the rake **50**, the rake tines **50b** must be lowered sufficiently so as to contact vegetation in front of the cutting deck. The mowing machine is started along with the bee displacement assembly **60c**. When the funnel attachment is used in conjunction with the blower **26** or the pulley-driven fan **74** shown in FIG. 13, the bee displacement assembly is actuated, forcing the air generated by the blower or the fan into the neck of the funnel attachment and emitted out the mouth **22c** as the concentrated stream of air. When the funnel attachment is appropriately angled, the stream of air disturbs an area in front of the cutting deck **90c**, and ideally, disturbs an area equal to the width of the cutting deck **90c**. The mowing machine is used in its normal fashion, but the stream of concentrated air emitted from the mouth **22c** sufficiently disturbs vegetation in the target area, causing animals such as bees to move away from the area immediately in front of the cutting deck **90c**. The operator of the mowing machine can selectively operate the bee displacement assembly by actuating the on/off switch assembly **30c**, as a power-saving feature. In other embodiments, the bee displacement assembly is always operational when the mowing machine is operational.

The inventor stresses that bees gathering nectar tenaciously cling to flowers, and ordinary wind pressure, even on very windy days, is inadequate to encourage the bees to leave their respective flowers. Bees are very difficult to see on vegetation being cut, because the mowing machines move quickly, and even the most ardent bee-lover is usually oblivious to the fact that his or her lawn mower is responsible for the deaths of thousands of honeybees over a typical summer all in the name of keeping the lawn neat and tidy. The bee displacement assembly and its embodiments, and the method of moving bees is the creative culmination of the inventor's desire to save the honeybee.

It is to be understood that the above-described arrangements are only illustrative of the application of the principles

of the present invention. Numerous modifications and alternative arrangements may be devised by those skilled in the art without departing from the scope of the present invention. While the inventor is concerned with saving bees, there are many insect pollinators that will also be effectively displaced by the invention. Young animals, such as fawns and rabbit kits, hiding in tall grass are often killed by high speed riding or zero-turn mowing machines, and may be encouraged to move out of the way of an oncoming mowing machine when blasted with the concentrated stream of air, or alternatively, the stream of air moves the vegetation sufficiently to allow the operator to visualize and then avoid killing the young animal or destroying a hidden nest in the grass.

What is claimed is:

1. A bee displacement apparatus used to pretreat an area of vegetation immediately prior to cutting the area of vegetation, the bee displacement apparatus comprising:

a motorized mowing machine having a cutting deck and a control switch;

a motorized blower affixed to the motorized mowing machine;

a funnel attachment affixed to the motorized blower; and a control assembly;

wherein the motorized blower has an output of less than 1000 CFM;

wherein the funnel attachment is further comprised of a neck at one end, a mouth at an opposed end, and a passageway joining the neck and the mouth, with a midpoint positioned along the passageway between the neck and the mouth;

wherein the passageway at the midpoint tapers towards the mouth such that a vertical measurement of the neck is greater than a vertical measurement at the mouth;

wherein the passageway at the midpoint widens towards the mouth such that a horizontal measurement of the mouth is greater than a horizontal measurement of the neck; and

wherein the mouth of the funnel attachment is oriented at the area of vegetation directly in front of the cutting deck of the motorized mowing machine,

whereby actuating the blower with the control assembly causes a concentrated stream of air to be emitted from the mouth towards the area of vegetation directly in front of the cutting deck.

2. The bee displacement apparatus of claim 1, wherein the vertical measurement of the mouth is at least one-half inch.

3. The bee displacement apparatus of claim 2, wherein the horizontal measurement of the mouth is at least seven inches.

4. The bee displacement apparatus of claim 1, wherein the mouth is oriented so as to emit the concentrated stream of air in a direction perpendicular to a forward motion of the cutting deck of the motorized mowing machine.

5. The bee displacement apparatus of claim 1, wherein the mouth is oriented so as to emit the concentrated stream of air in a direction parallel to a forward motion of the cutting deck of the motorized mowing machine.

6. The bee displacement apparatus of claim 1, wherein the control assembly is integrated with the control switch of the motorized mowing machine.

* * * * *